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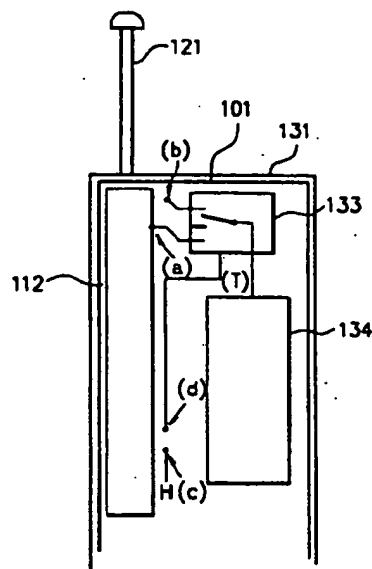
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(54) Constitution of protrusible external and fixed internal antenna for radio portable remote terminal device

(57) In a radio portable remote terminal device which has two antennas, there is provided a constitution of antenna in which an antenna of not in use gives good effect to an antenna of presently in use reciprocally. There are provided external antenna measures 121 to 125 whose external antenna element 121 is capable of protruding from an enclosure 131 and whose external antenna element 121 is capable of being contained into the enclosure 131 reciprocally, internal antenna measures 111 to 114 having a ground section 111, a measure for judging whether the external antenna element 121 is protruded from the enclosure 131 or the external antenna element 121 is contained in the enclosure 131, a switching circuit 133 for switching connection between the external antenna measures 121 to 125 and a radio section circuit 134 for connection between the internal antenna measures 111 to 114 and the radio section circuit 134 reciprocally, and a printed circuit board 101 capable of mounting the external antenna measure 121 to 125 whose external antenna element 121 is contained in the enclosure 131 and the internal antenna measures 111 to 114 on both side thereof. There is provided a measure which functions such that when the external antenna element 121 is contained into the enclosure 131, a radio section circuit 134 on the printed circuit board 101 is cut away the external antenna measures 121 to 125 to be connected to the internal antenna measures 111 to 114, while when the external antenna element 121 is protruded from the enclosure 131, the radio section circuit 134 on the printed circuit board 101 is cut away the internal antenna measures 111 to 114 to be connected to the external antenna measures 121 to 125.

FIG. 3



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Description

The present invention relates to a constitution of antenna for a radio portable remote terminal device. More to particularly this invention relates to a constitution of protrusible external and fixed internal antennas for the radio portable remote terminal device, in which not only it causes bad interference to eliminate between the external antenna and the internal antenna but also it causes good influence to effect with each other.

In recent years, with respect to the radio portable remote terminal device, portability comes to be inquired. Thus an antenna during carriage by the user came to be changed into an antenna during presently in use by the user. Namely, since giving and taking in terms of information is not implemented frequently during carriage of the radio portable remote terminal device, the internal antenna which is good for portability is used, even if gain is decreased slightly. While since giving and taking in terms of information is implemented frequently during presently in use of the radio portable remote terminal device, it causes an antenna to protrude from the enclosure, thus the antenna gain comes to be secured. The conventional example is the Japanese Utility Model Application Laid-Open No. HEI 4-31805 which discloses that when a protrusible antenna is protruded from an enclosure, an internal antenna is cut away the protrusible antenna, while when the protrusible antenna is contained in the enclosure, the internal antenna is connected to the protrusible antenna.

Fig. 1 shows such a conventional example of a radio portable remote terminal device which comprises an internal antenna 212, a feed section 213 of the internal antenna 212, an external antenna 221 which is capable of protruding and being contained in terms of an enclosure reciprocally, a metal fittings 222 of the feed section of the external antenna 221, and metal fittings 223 and 224 which generate a signal for judging whether the external antenna 221 is protruded from the enclosure or the external antenna 221 is contained in the enclosure. (When the metal fittings 223 is connected to the metal fittings 224 through the external antenna 221, the metal fittings 223 comes into H-state.)

The conventional radio portable remote terminal device further comprises a holding cylinder 225, and a printed circuit board 201, both of which operates such that the external antenna 221 is protruded or contained smoothly.

Moreover, such the conventional example of the radio portable remote terminal device further comprises an enclosure 231 for casing the radio portable remote terminal device, a circuit block 234 of a radio section, and a change-over switch circuit 233 for switching the connection to the external antenna to the connection to the internal antenna reciprocally. The antenna which is connected to the circuit block 234 of the radio section is switched by the change-over switch circuit 233 in accordance with the "H"-state or the "L"-state of the

input portion T. A shield 232 of the circuit of the printed circuit board functions as ground means when the external antenna 221 is protruded from the enclosure to implement improvement of gain of the external antenna 221.

In the conventional example of Fig. 1, since two antennas are constituted independently with each other, interference of respective antennas can produce deterioration of antenna characteristic. It is necessary to separate respective antennas in order to prevent interference of the respective antennas accordingly. Namely, when mounting of the device is capable of being implemented in consideration of respective arrangement of antenna because of the radio portable remote terminal device with large space, interference between antennas may be disregarded. However interference between antennas becomes incapable of being disregarded due to tendency of miniaturization of the radio portable remote terminal device.

Further, as described above, it is necessary to secure the ground means in order to improve gain of external antenna, therefore, it is necessary to form the ground means on the printed circuit board so that there is a problem that it facilitates restriction to be affected to mounting of the device.

In view of the foregoing, it is an object of the present invention to provide a constitution of protrusible external and fixed internal antennas for a radio portable remote terminal device in which it causes interference to eliminate between the protrusible external antenna and the fixed internal antenna, and in which gain of the external antenna presently in use is capable of being improved by utilizing the internal antenna which is of not in use at the time of using the radio portable remote terminal device.

According to one aspect of the present invention, for achieving the above-mentioned object, there is provided a constitution of protrusible external and fixed internal antennas for a radio portable remote terminal device having first antenna means whose external antenna element is supported by an enclosure of the radio portable remote terminal device in such a way that the external antenna element of the first antenna means is capable of being protruded from the enclosure during presently in use of the radio portable remote terminal device, while the external antenna element of the first antenna means is capable of being contained in the enclosure during not in use thereof, second antenna means consisting of a ground and an antenna element capable of being contained in the enclosure, a printed circuit board on which a radio circuit is mounted, and switching means for switching connection between the first antenna means and a radio circuit to connection between the second antenna means and the radio circuit reciprocally, wherein the printed circuit board intervenes between the first antenna means and the second antenna means when the external antenna element of the first antenna means is contained in the enclosure.

According to another aspect of the invention, there is provided a constitution of protrusible external and fixed internal antennas for a radio portable remote terminal device further having means for cutting the radio circuit on the printed circuit board away the first antenna means, and for connecting the radio circuit on the printed circuit board with the second antenna means at the time when the external antenna element of the first antenna means is contained in the enclosure to be recognized, wherein the first antenna means which is cut away is arranged under a surface of the ground means of the second antenna means.

According to another aspect of the invention, there is provided a constitution of protrusible external and fixed internal antennas for a radio portable remote terminal device further having means for cutting the radio circuit on the printed circuit board away the second antenna means, and for connecting the radio circuit on the printed circuit board with the first antenna means at the time when the external antenna element of the first antenna means is protruded from the enclosure to be recognized, wherein ground means of the second antenna means which is cut away is arranged as a ground of said first antenna.

According to another aspect of the invention, there is provided a constitution of protrusible external and fixed internal antennas for a radio portable remote terminal device, wherein when the external antenna element of the first antenna means is protruded from the enclosure, the first antenna means is not electrically connected with the second antenna means, while when the external antenna element of the first antenna means is contained in the enclosure, the first antenna means is electrically connected with the second antenna means.

According to another aspect of the invention, there is provided a constitution of protrusible external and fixed internal antennas for a radio portable remote terminal device, wherein judgement whether or not the first antenna means is electrically connected with the second antenna means is implemented by metal fittings.

According to another aspect of the invention, there is provided a constitution of protrusible external and fixed internal antennas for a radio portable remote terminal device, wherein the first antenna means is an external antenna, and the second antenna means is an internal antenna.

As stated above, a constitution of protrusible external and fixed internal antennas for a radio portable remote terminal device according to the invention is provided with external antenna means whose external antenna element is capable of protruding from an enclosure and which is capable of being contained into the enclosure reciprocally, internal antenna means having a ground section, a measure for judging whether the external antenna element is projected or the external antenna element is contained, a switching circuit for switching the external antenna means for the internal antenna means reciprocally, and a printed circuit board

capable of mounting the external antenna means whose external antenna element is contained and the internal antenna means on both side thereof.

Further the constitution of protrusible external and fixed internal antennas for the radio portable remote terminal device in which when the external antenna element of the external antenna means is contained in the enclosure, the external antenna means does not effect influence to the internal antenna means presently in use, while when the external antenna element of the external antenna means is protruded from the enclosure, the internal antenna means functions as the ground means of the external antenna means presently in use to improve gain of the external antenna means.

The above and further objects and novel features of the invention will be more fully understood from the following detailed description when the same is read in connection with the accompanying drawings. It should be expressly understood, however, that the drawings are for purpose of illustration only and are not intended as a definition of the limits of the invention.

Fig. 1 is a whole view showing a conventional example of a radio portable remote terminal device; Fig. 2A is a sectional view showing a state that the external antenna element is contained; Fig. 2B is a sectional view showing a state that the external antenna element is protruded; and Fig. 3 is a whole view showing a preferable embodiment of a radio portable remote terminal device according to the present invention.

A preferred embodiment of the present invention will now be described in detail referring to the accompanying drawings.

Fig. 2A is a sectional view showing a state that the external antenna element is contained in the enclosure. Fig. 2B is a sectional view showing a state that the external antenna element is protruded from the enclosure.

A constitution of a radio portable remote terminal device according to the present invention will be explained referring to Figs. 2A and 2B. The radio portable remote terminal device comprises a printed circuit board 101, internal antenna means 111 to 114, and external antenna means 121 to 125. In the constitution, the internal antenna means 111 to 114 consist of a ground 111, an antenna element 112, a feed section 113, and a short-circuit plate 114 for connecting the ground 111 with the antenna element 112. The external antenna means 121 to 125 consist of an external antenna element 121, a feed section metal fittings 122, and judgement metal fittings 123 and 124 for denoting judgement whether the external antenna element is the enclosure or the external antenna element is contained in the enclosure such that whether both judgement metal fittings 123 and 124 are connected or disconnected with each other, and an external antenna cylind-

der 125 for containing the external antenna element 121. Furthermore, a reference mark (a) denotes an internal antenna feed section. A reference mark (b) denotes an external antenna feed section. Reference marks (c) and (d) denote judging sections for judging whether the external antenna is protruded or the external antenna is contained.

Fig. 3 is a whole view showing an embodiment of the present invention. A radio portable remote terminal device comprises an enclosure 131 of the radio portable remote terminal device, a switch circuit 133 for antennas, and a radio circuit 134. Besides, in Fig. 3, a reference mark (a) denotes an internal antenna feed section. A reference mark (b) denotes a feed section of the external antenna means 121 to 125. Reference marks (c) and (d) denote judgement sections for judging whether the external antenna element is projected or the external antenna element is contained. These reference marks are the same as those of Figs. 2A and 2B.

Next, operation of the embodiment of the constitution of protrusible external and fixed internal antennas for the radio portable remote terminal device according to the present invention will be explained referring to Figs. 2A, 2B, and 3.

Fig. 2A is a cross-sectional view at the time when the external antenna element 121 is contained in the enclosure. The judgement metal fittings 123 and 124 judge whether the external antenna element 121 is projected from the enclosure 131 or the external antenna element 121 is contained in the enclosure 131. The metal fittings 123 is electrically connected with the metal fittings 124 through the external antenna element 121. Therefore an "H"-signal of the metal fittings 124 is inputted to an input portion A of the switch circuit 133 shown in Fig. 3 by way of the metal fittings 123. By virtue of this input, an input of the radio section circuit 134 is connected to the feed section (a) of the internal antenna means 111 to 114, thus the internal antenna means 111 to 114 come into in use. At this time the external antenna means 121 to 125 become not in use to be unnecessary antenna. Since the external antenna means are arranged just under the surface of the ground means of the internal antenna means 111 to 114 so that the external antenna means 121 to 125 do not effect influence to the antenna element 112, with the result that it is capable of ensuring required characteristic.

Fig. 2B is a cross-sectional view at the time when it causes the external antenna element 121 to protrude from the enclosure. The judgement metal fittings 123 and 124 which can denote the judgement whether the external antenna element 121 is protruded from the enclosure or the external antenna element 121 is contained in the enclosure. The metal fittings 123 is not electrically connected with the metal fittings 124, therefore, "L"-signal is inputted to the input portion T of the switch circuit 133 shown in Fig. 3. By virtue of this input, the input of radio section circuit 134 is connected with

the feed section (b) of the external antenna means 121 to 125, thus the external antenna means 121 to 125 come into in use. At this time the internal antenna means 111 to 114 become not in use to be unnecessary antenna. The internal antenna means 111 to 114 possess the function as the ground means of the external antenna means 121 to 125 so that these contribute to the gain improvement of the external antenna means 121 to 125.

As described above, the constitution of protrusible external and fixed internal antennas for the radio portable remote terminal device according to the present invention is capable of realizing improvement of characteristic of respective antennas with a small space, therefore this is a useful technic in future miniaturization of the radio portable remote terminal device.

While preferred embodiments of the invention have been described using specific terms, such description is for illustrative purpose only, and it is to be understood that changes and variations may be made without departing from the spirit or scope of the following claims.

Claims

1. A constitution of protrusible external and fixed internal antennas for a radio portable remote terminal device comprising:

first antenna means (121 to 125) whose external antenna element 121 is supported by an enclosure (131) of a radio portable remote terminal device in such a way that said external antenna element (121) is capable of being protruded from said enclosure (131) during presently in use of said radio portable remote terminal device, while said external antenna element (121) is capable of being contained in said enclosure (131) during not in use of said radio portable remote terminal device;

second antenna means (111 to 114) which consist of ground means (111) and an antenna element (112) capable of being contained in said enclosure (131);

a printed circuit board (101) on which a radio section circuit (134) is mounted; and switching means (133) for switching connection between said first antenna means (121 to 125) and said radio section circuit (134) for connection between said second antenna means (111 to 114) and said radio section circuit (134) reciprocally,

wherein said printed circuit board (101) intervenes between said first antenna means (121 to 125) and said second antenna means (111 to 114) when said external antenna element (121) of said first antenna means (121 to 125) is contained in said enclosure (131).

2. A constitution of protrusible external and fixed internal antennas for a radio portable remote terminal device as claimed in claim 1, further comprising:

means for cutting said radio section circuit (134) on said printed circuit board (101) away said first antenna means (121 to 125), before connecting said radio section circuit (134) on said printed circuit board (101) with said second antenna means (111 to 114) at the time when said external antenna element (121) of said first antenna means (121 to 125) is contained in said enclosure (131) to be recognized,

wherein said first antenna means (121 to 125) which is cut away is arranged under a surface of said ground means (111) of said second antenna means (111 to 114).

3. A constitution of protrusible external and fixed internal antennas for a radio portable remote terminal device as claimed in claim 1, further comprising:

means for cutting said radio section circuit (134) on said printed circuit board (101) away said second antenna means (111 to 114), before connecting said radio section circuit (134) on said printed circuit board (101) with said first antenna means (121 to 125) at the time when said external antenna element (121) of said first antenna means (121 to 125) is protruded from said enclosure (131) to be recognized,

wherein ground means (111) of said second antenna means (111 to 114) is arranged as ground means of said first antenna means (121 to 125).

4. A constitution as claimed in claim 1, 2, or 3,

wherein when said external antenna element (121) of said first antenna means (121 to 125) is protruded from the enclosure (131), said first antenna means (121 to 125) is not electrically connected with said second antenna means (111 to 114), while when said external antenna element (121) of said first antenna means (121 to 125) is contained in the enclosure (131), said first antenna means (121 to 125) is electrically connected with said second antenna means (111 to 114).

5. A constitution as claimed in claim 1, 2, 3 or 4,

wherein judgement whether or not said first antenna means (121 to 125) is electrically connected with said second antenna means (111 to 114) is implemented by metal fittings (123, 124).

6. A constitution as claimed in any one of claims 1 to 5,

wherein said first antenna means (121 to 125) is an external antenna, and said second antenna means (111 to 114) is an internal antenna.

FIG. 1 PRIOR ART

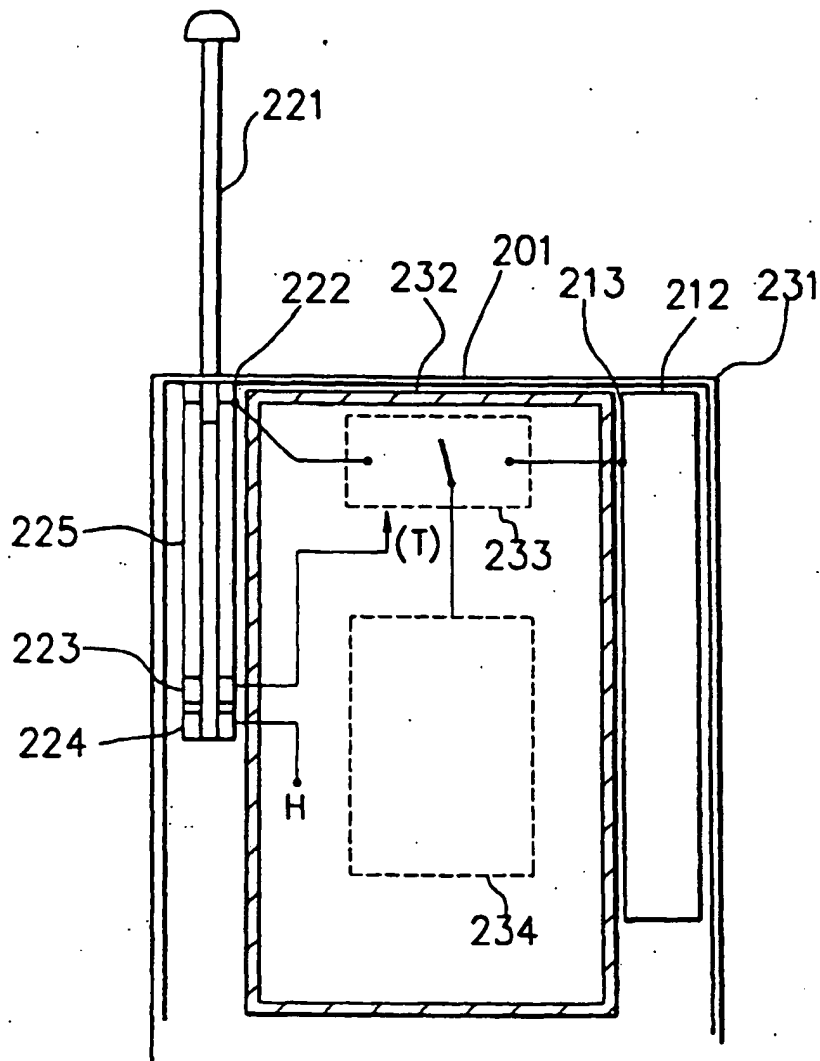


FIG. 2A

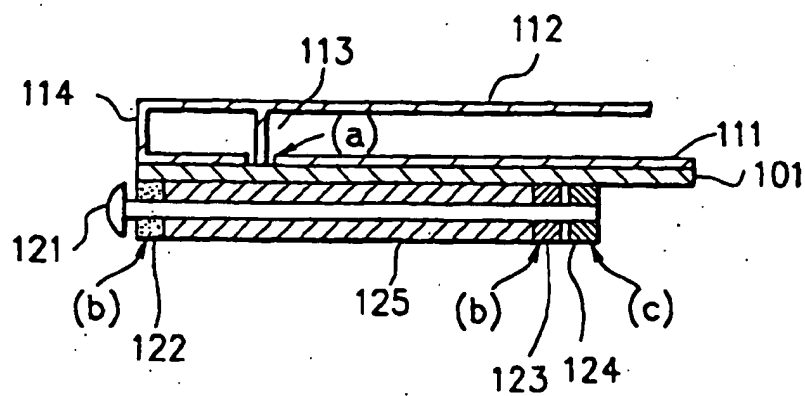


FIG. 2B

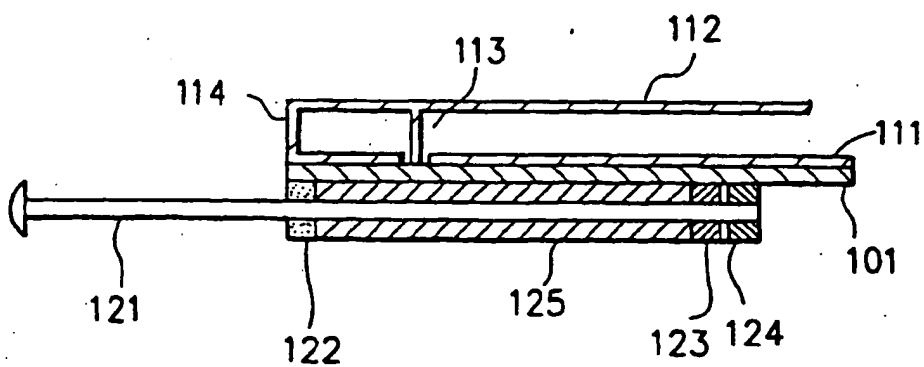
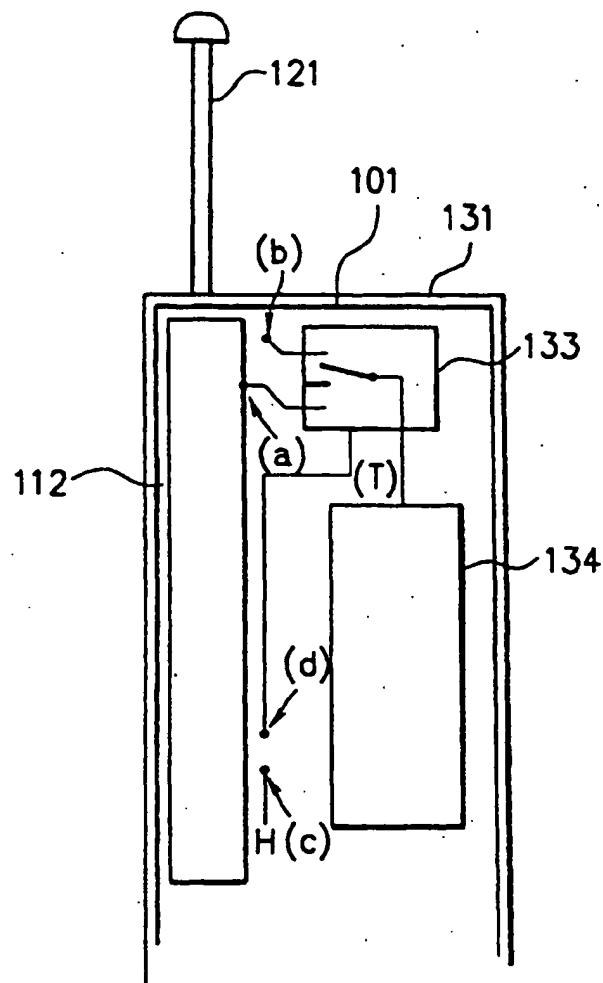


FIG. 3





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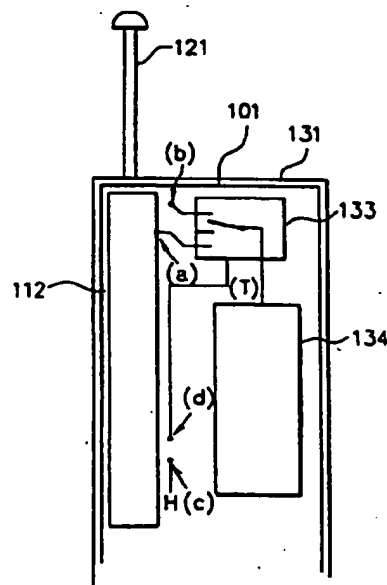
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(54) Constitution of protrusible external and fixed internal antenna for radio portable remote terminal device

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FIG. 3



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EUROPEAN SEARCH REPORT

Application Number

EP 97 12 0000

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Place of search THE HAGUE		Date of completion of the search 16 December 1999	Examiner Ribbe, J
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